“Effect of Hypnotherapy on Neurological,Psycho-Physiological parameters and Performance among Elite Indian Shooters”

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Table of Content

Chapter	Content	Page no.
	Table of Contents	**2**
	List of tables and Figures	**3**
I.	**Introduction**	**5-20**
	Statement of problem	
	Research Questions	
	Objectives of the study	
	Hypothesis	
	Delimitation	
	Limitation	
	Significance of the Study	
II.	**Review of Related Literature**	**21-28**
III.	**Methodology**	**29-35**
	Selection of the subject	
	Selection of Variables	
	Selection of Test	
	Research Design	
	Administration of test and collection of data	
	Proposed statistical Procedure to be Used	
	Appendix-1	**36**
	Appendix-2	**37**
	References	**38-40**

List of Tables

Table	Description	Page no.
1	Physiological variables and its effects	**7**

List of Figures

Figure	Description	Page no.
1	Breathing Pattern for shooters	**6**
2	5 Types of Brain Waves and Frequencies	**10-13**
3	Gamma waves	
4	Beta waves	
5	Alpha waves	
6	Theta waves	
7	Delta waves	
8	Diagrammatic representation of research design	**35**

ABSTRACT

Shooting is a sport which requires extreme precision, striking control and close co-ordination between eye, nervous system and the musculoskeletal system. Anxiety and stress are frequent experiences for athletes before a major event. Negative moods and mental pressure can impair not just their regular training and lives, but also their competition performance. Stress can alter both physiological and psychological functioning, according to research (Ji, 1992). Increased respiratory rate, heart rate, and blood pressure; clouded perceptions, slower reactions, and reasoning, as well as distracted concentration. These negative factors can have an impact on athletes' competition performance. Hypnosis appears to alter cognitive processes such as self-confidence, concentration, and memory, all of which are crucial for athletic performance. The primary objective of the study is to investigate whether 12 weeks of Hypnotherapy influences neurological & psycho-physiological and performance aspects such Brain waves, Competition anxiety, Flow State, Mental skills, blood pressure respiration rate, skin conductance and heart rate of elite Indian shooters before a competition and also to study the relationship among Neurological and psycho-physiological variables with performance. To investigate these objective MANOVA and Pearson's correlation tests may be conducted after data collection. The study may be delimited to participants having been participating in competitive shooting sports for minimum of 3 years with N=60 (Age ranging from 18-25 years) with 30 experimental and 30 active control group, further divided into Pistol, rifle & shotgun. To enhance comprehension, a qualitative method may be integrated for 24 shooters (12 from the experimental group and 12 from the active control group) who will be randomly selected for interviews. This research is significant for its ability to provide a cohesive representation of neurological, psycho-physiological, and performance characteristics. This will allow sports scientists to predict shooter performance, provide a framework for future research in sports psychology and neurology, enhance existing knowledge in sports neurology, psychology, and physiology, and support coaches, sports trainers, sports administrators, and physical educators in their professional endeavors by educating them on the neurological and psycho-physiological aspects of shooters. To thoroughly appreciate the probable advantages of hypnosis in athletics, more study and empirical proof are required.

Keywords: Anxiety, Blood Pressure, Brain waves Competition Anxiety , Flow states, Heart rate, Hypnotherapy, Indian Shooter, Mental Skills, Nervous system, Neurological Performance, Psychology, Psycho-physiology, Respiration rate, Skin Conductance.

Chapter I
INTRODUCTION

The current competitive sports landscape in India, coupled with an increasing desire to win, is generating pressure that adversely impacts performance. The sport of shooting, increasingly favored by individuals of all ages in India, comprises various competitive events. The International Shooting Sport Federation has documented 20 prestigious tournaments in rifles, pistols, and shotguns.The rifle category that is often contested is the 10-meter air rifle category (ISSF, 2020). The state of the equipment is stable, and the shooter's posture affects the accuracy of the shot (Kayihan et al., 2013). Sharp eyesight also significantly affects the level of accuracy in shooting (Jamara et al., 2008).

An Overview of Shooting Sport:

Shooting is a sport that necessitates exceptional precision, precise control, and precise coordination among the visual system, neurological system, and musculoskeletal system. This sport mostly relies on bodily alignment and mental stability.

1. The shooter must aim at the target while breathing; the normal inhalation and exhalation movements of the chest wall cause the weapon to move vertically.
2. The movement caused by respiration renders it impossible to achieve an accurate shot without breath control.

However, following the cessation of respiration, the body's functions begin to deteriorate due to the onset of oxygen shortage. The eye's functioning declines initially, followed by muscle contraction. The breath hold should not be prolonged to the extent that an unusual sensation arises. Extended oxygen deprivation leads to weariness, muscle spasms, and clouded vision, necessitating a physiological urge to breathe as the body indicates the need to restore respiration for survival. These indicators provoke involuntary diaphragm contractions, which impair the shooter's concentration and result in movement of the chest wall. All of which are detrimental to executing an accurate shot. Marksmen must utilize breath control during the firing process.

They must attain ocular alignment when inhaling and complete pointing and shooting while exhaling. Shooters achieve this by inhaling and exhaling naturally, halting at the precise moment of physiological exhalation to initiate a respiratory hold, firing the shot, and thereafter

resuming inhalation. The duration of breath-holding should not be extended. If firing does not occur within seven seconds, the shooter will become disengaged and forgo the opportunity to take the shot. He will lower the rifle and commence anew, as prolonged retention of the stance may result in the shooter losing the stability and focus essential for executing the shot.

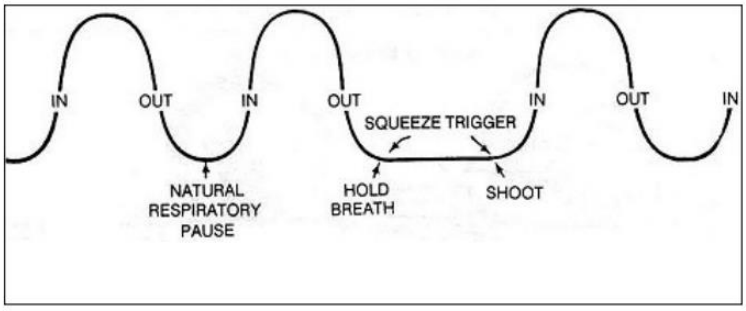

Figure-1 Breathing Pattern for shooters

Proper breathing is frequently neglected in the fundamental concepts of Pistol and Rifle shooting, despite its ability to minimize undesirable weapon movements and promote a relaxing effect. Respiration connects physical, mental, and emotional states. The three principal impediments to the flow of good emotional energy—anger, grief, and fear—are each marked by a disruption in respiration. Anger frequently results in feeble inhalation accompanied by vigorous and forceful expiration. Sadness is characterized by feeble exhalation accompanied by irregular, spasmodic inhaling.

Currently, numerous unique skills and techniques are being implemented in the domain of Sports Psychology to improve player performance. Numerous cognitive training approaches have significantly contributed to both modern and historical studies, with visualization and hypnosis garnering considerable attention globally. Utay and Miller (2006) indicated that guided imagery has a history exceeding 2,000 years and has seen considerable evolution in the last century (as reported in Kress, Adamson, Demarco, Paylo, & Zoldan, 2013, p. 39).

The mind-body principle is fundamental, yet another crucial aspect that facilitates hypnosis is the attainment of an altered state of consciousness. A person undergoes a transient alteration in their mental state while being conscious (Naparstek, 2000). In altered states of consciousness, an individual can achieve rapid and profound learning, performance, and healing (Naparstek, 2000). Alterations in brainwave activity and biochemistry result in changes

to cognition and emotion (Naparstek, 2000). A person begins to exhibit increased creativity, intuition, and confidence, occasionally feeling invincible (Naparstek, 2000).

Anxiety affect the following psychological grounds of the sports shooter

1. Sensomotoric co-ordination
2. Sense of balance
3. Scale and length of focus.
4. Ability to re-focus
5. Ability to control pain

Table-1 Physiological variables and its effects :

Organ	Sympathetic Nervous System	Parasympathetic Nervous System
Heart	Increase in contractile force and pulse (shortened time of transition)	Decrease in contractile force and pulse (longer time of transition)
Vascular System	Increased tonicity (vasoconstriction)	Decreased tonicity (vasodilation)
Bronchial System	Dilation	Constriction
Stomach/Intestine	Retardation of peristalsis	Increase of peristalsis
Pupils	Dilation	Constriction
Palpebral fissure	Dilation	-
Hair follicles	Muscle contraction	-
Genitalia	Orgasm reflex	Secretion
Stomach, Intestinal Gland, Pancreas	-	-
Sweat Glands	Secretion	-
Lacrimal Gland	Slight secretion	Strong secretion
Adrenal Medulla	Hormonal output	-

Anxiety adversely affects task performance, often leading to diminished attention and concentration, resulting in persons failing to reach their potential. Elevated anxiety levels often impede performance, even in highly capable individuals. This holds true in sports performance and elucidates why anxiety is among the most extensively studied subjects in sport psychology (Bunker & Williams, 1986).

Heart rate variability

Heart Rate Variability (HRV) is frequently utilized in sports science as a measure of an athlete's physiological preparedness for training and competition in endurance sports (Podstawski, Boraczynski, Nowosielska-Swadzba, & Zwolinska, 2014). Although heart rate variability (HRV) can signify worry through diminished HRV and vagal tone (Friedman, 2007), few studies have examined the psychologically associated physiological dimension of HRV in athletes.

Blood pressure

Generally, an individual's "blood pressure," or systemic arterial pressure, denotes the pressure assessed within major arteries of the systemic circulation. This figure is divided into systolic and diastolic blood pressure. Blood pressure is conventionally assessed using auscultation utilizing a mercury-tube sphygmomanometer. It is quantified in millimeters of mercury and articulated as systolic pressure over diastolic pressure. Systolic pressure denotes the peak pressure in the major arteries during the contraction of the heart muscle, which facilitates blood circulation throughout the body. Diastolic pressure refers to the minimum pressure in the major arteries during the relaxation phase of the cardiac cycle.

Flow State

Flow is a psychological condition defined by complete absorption and concentration in an action, executed with enjoyment. This condition is deemed best for performance. Flow state is a harmonic, extremely positive, joyful, and intrinsically satisfying psychological condition, marked by strong concentration, profound immersion in an activity, and a sensation of coherence, regardless of obstacles (Csikszentmihalyi, 2002).

Flow theory (Csikszentmihalyi, 2002) describes the experience of flow in nine dimensions, being six characteristics of such a mental state: (1) intense concentration; (2) merging of awareness (what is perceived) and action (how to act/react); (3) decreased awareness of social evaluation or self-judgment (loss of self-consciousness); (4) sense of control over performing an activity and its outcomes; (5) transformation of time, seeming to either speed up or slow down; (6) the autotelic characteristic of the experience, of being pleasurable and rewarding. The other three dimensions are considered prerequisites for experiencing flow: (I) balance between challenge and skill, where there is a high challenge that

the athlete feels capable of overcoming; (II) clear goals, guiding the athletes' efforts; (III) unambiguous feedback regarding one's progress toward set goals (Csikszentmihalyi, 2000).

Mental Toughness (Skills)

The success or failure of sportsmen is multifaceted. The outcome is influenced by various aspects, including physical, tactical, technical, and psychological elements. In numerous sports, the psychological dimension is the determining factor distinguishing a champion from a defeated competitor (Brewer, 2009). Weinberg and Gould (2003) assert that mental talent constitutes over fifty percent of an athlete's success in competition versus adversaries. Moreover, Gould, Hodge, Peterson, and Petlichkoff (1987) assert that mental toughness is the paramount determinant of success in wrestling, with a rating of 82 percent.

Mental toughness was identified as a primary psychological element influencing effective performance in a study including ten Olympians (Gould, Dieffenbach, & Moffett, 2002). Notwithstanding its prevalent application, the notion of mental toughness continues to be subjective. This term is often employed to denote a comprehensive concept that reflects an athlete's ability to effectively manage training and competitive adversities to maintain resilience (Bull, Shambrook, James, & Brooks, 2005; Connaughton et al., 2008; Fourie & Potgieter, 2001; Jones, Hanton, & Connaughton, 2007; Thelwell, Weston, & Greenlees, 2005).

Mental toughness is frequently cited by athletes, coaches, and applied sports psychologists as a critical psychological trait linked to performance and success in elite sports. Nonetheless, it remains one of the most misconstrued terms in applied sport psychology (Jones, Hanton, & Connaughton, 2002).

BRAIN WAVES

The brain comprises billions of neurons, with each neuron often connecting to thousands of others. Communication occurs via tiny electrical impulses that traverse neurons and extensive networks of cerebral circuitry. When all these neurons are stimulated, they generate electrical impulses—imagine a wave propagating across a crowd at a sports arena—this coordinated electrical activity culminates in a "brainwave."

The simultaneous interaction of several neurons generates activity sufficiently robust to be detected externally from the brain. This activity can be enhanced, examined, and depicted

by positioning electrodes on the scalp. This is electroencephalography, or EEG - a sophisticated term that denotes an electrical representation of brain activity. Encephalon, or the brain, originates from the ancient Greek term “enképhalos,” signifying within the head.

Certain brain oscillations are more readily identifiable on various regions of the scalp, correlating with the underlying areas of the brain. The brain comprises numerous specialized regions that correlate to distinct processes, thoughts, and experiences. Specific oscillations frequently indicate the communication between diverse regions and networks inside the brain.

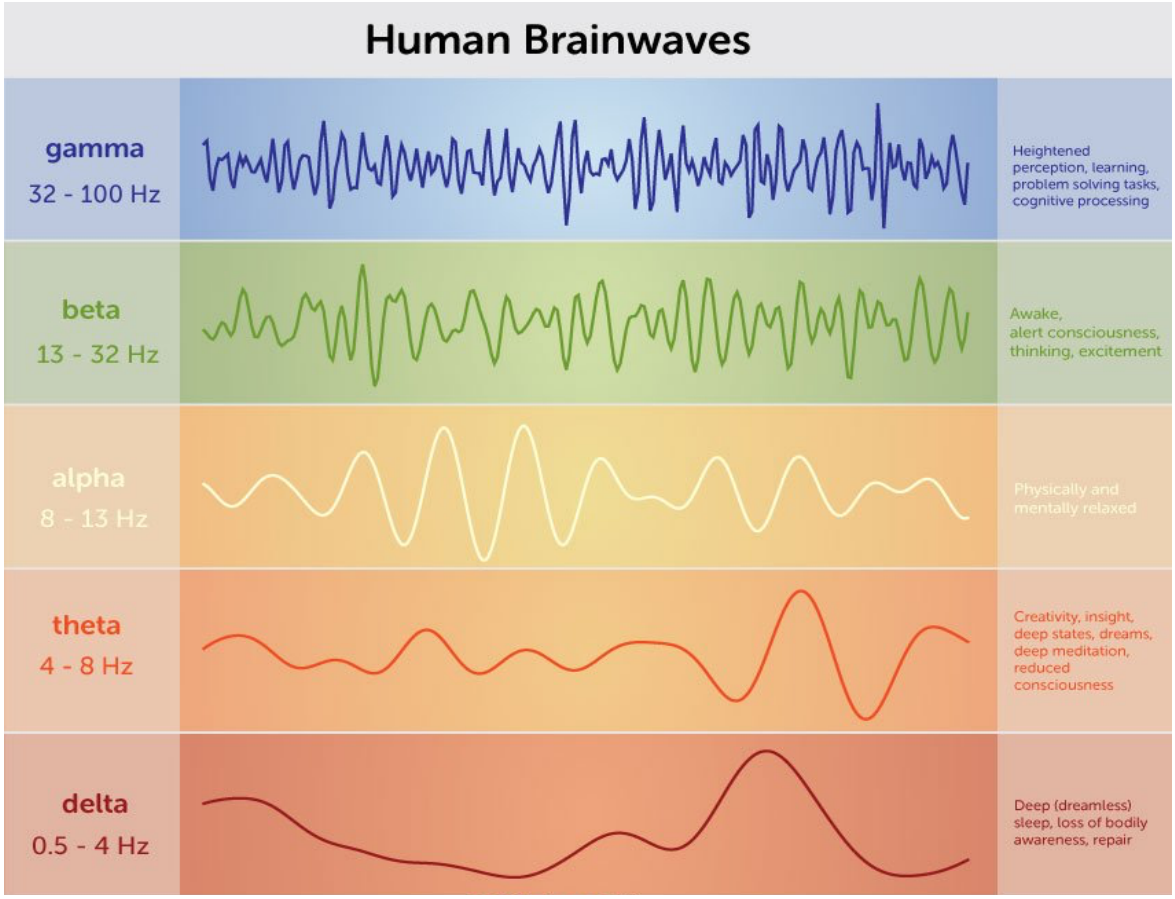

Figure-2. Five Types of Brain Waves and Frequencies

The 5 main types of brainwave frequencies

Different patterns of brainwaves can be recognized by their amplitudes and frequencies. Brainwaves can then be categorized based on their level of activity or frequency. It’s important to remember, though, that brainwaves are not the source or the cause of brain states, or of our experiences of our own minds – they’re just some of the detectable reflections of the complex processes in the brain that produce our experience of being, thinking, and perceiving.

- **Slow activity** refers to a lower frequency and high amplitude (the distance between two peaks of a wave). These oscillations are often much larger in amplitude (wave depth). Think: low, the deep beat of a drum.
- **Fast activity** refers to a higher frequency and often smaller amplitude. Think: high pitched flute.

Below are five often-described brainwaves, from the fastest activity levels to the slowest.

Figure-3. Gamma Waves

Gamma Brainwaves

- Frequency: 32 – 100 Hz
- Associated state: Heightened perception, learning, problem-solving tasks

Gamma brainwaves are the fastest measurable EEG brainwaves and have been equated to 'heightened perception', or a 'peak mental state' when there is simultaneous processing of information from different parts of the brain. Gamma brainwaves have been observed to be much stronger and more regularly observed in very long-term meditators including Buddhist Monks.

Figure-4. Beta waves

Beta Brainwaves

- Frequency: 13-32 Hz
- State: Alert, normal alert consciousness, active thinking

For example:

- Active conversation
- Making decisions

- Solving a problem
- Focusing on a task
- Learning a new concept

Beta brainwaves are easiest to detect when we're busy thinking actively.

Figure-5. Alpha waves

Alpha Brainwaves

- Frequency: 8-13 Hz
- State: Physically and mentally relaxed

Alpha brainwaves are some of the most easily observed and were the first to be discovered. They become detectable when the eyes are closed and the mind is relaxed. They can also often be found during activities such as:

- Yoga
- Just before falling asleep
- Being creative and artistic

Figure-6. Theta waves

Theta Brainwaves

- Frequency: 4-8 Hz
- State: Creativity, insight, dreams, reduced consciousness

According to Professor Jim Lagopoulos of Sydney University, "previous studies have shown that theta waves indicate deep relaxation and occur more frequently in highly experienced meditation practitioners. The source is probably frontal parts of the brain, which are associated with monitoring of other mental processes."

Most frequently, theta brainwaves are strongly detectable when we're dreaming in our sleep (think, the movie *Inception*), but they can also be seen during :

- Deep meditation
- Daydreaming

When we're doing a task that is so automatic that the mind can disengage from it e.g. brushing teeth, showering. Research has also shown a positive association of theta waves with memory, creativity, and psychological well-being.

Figure-7. Delta Waves

Delta Brainwaves

- Frequency: 0.5-4 Hz
- State: Sleep, dreaming

These are the slowest of all brainwaves and are strongest when we are enjoying restorative sleep in a dreamless state. This is also the state where healing and rejuvenation are stimulated, which is why it's so crucial to get enough sleep each night.

HYPNOSIS

Introduction to Hypnosis

Hypnosis is a communication strategy based on psychological suggestion. The individual in a hypnotic state has heightened receptivity to suggestions. Hypnosis enables individuals to attain enhanced control over their cognitive processes and behaviors. The hypnotist will consistently employ auditory, visual, and tactile stimuli to facilitate the induction of a trance state in the subject during the hypnosis process. Simultaneously, the hypnotized subject will be directed to relax, visualize, and concentrate on the hypnotist's commands.

The hypnotist will employ several techniques to treat the patient's psychological disorders once the individual has entered the hypnotic state. Hypnosis is currently employed across diverse domains, including medical and psychotherapy practices, athletic training,

military operations, personal development, employee education, and police interrogations. Moreover, studies have shown that the hypnotic effect is associated with the subject's mindset and belief in the hypnotic process (Franquelo et al., 2020, 2021a,b). Hypnosis is progressively being acknowledged as a scientific psychological therapy method.

Athletes necessitate psychological training as an integral component of their sports preparation due to the inherent risk of error and potential loss in competitive events. Numerous elite athletes have devoted decades to compete at the pinnacle of their sport, yet they do not consistently achieve victory. The misconduct of athletes serves as both a PR tactic and a topic of discourse in the community. Consequently, as athletes ascend to elite levels, they encounter more psychological pressure.

Sports psychologists may employ hypnosis in athletes' psychological training to facilitate relaxation during practice and competition, as well as to alleviate anxiety and manage stress (Paccagnella, 2004). Hypnosis is a fundamental and uncomplicated technique for modifying physical and mental training that necessitates no specific environment or apparatus. A previous study indicated that hypnosis enhanced performance across many sports, with the most significant effects observed in basketball, golf, soccer, and badminton (Milling and Randazzo, 2016). Hypnosis is frequently utilized in athletics and competitions.

THE APPLICATIONS OF HYPNOSIS IN SPORTS

Hypnosis seems to modify cognitive functions like self-assurance, focus, and memory, all of which are essential for athletic performance. Hypnosis is often employed to enhance positive self-affirmations and rational-emotive techniques (Taylor et al., 1993). Athletes can leverage this "believed-in" state to enhance and access the potential of their physical circumstances. The recommendation provided by hypnotists, such as "you can perform well today" or "you can transcend your limitations," can assist patients in achieving their intended goals. These affirming statements can assist individuals in restoring their self-esteem, enabling them to concentrate more effectively on their tasks and attain their goals with greater expediency.

Hypnosis Can Relieve the Anxiety of Athletes

Apprehension and tension are common occurrences for athletes prior to a significant competition. Adverse moods and psychological stress might hinder not just their routine training and daily lives but also their competitive performance. Research indicates that stress can modify both physiological and psychological performance (Ji, 1992). Elevated respiration rate, heart rate, and blood pressure exemplify the former; impaired perceptions, diminished reaction times, compromised cognition, and distracted focus illustrate the latter. These adverse conditions can affect athletes' competitive performance.

Hypnosis can assist athletes in achieving relaxation and composure prior to and during tournaments. "You may be recognizing that you are becoming increasingly silent, and your breathing is becoming progressively more tranquil," the hypnotist informs the hypnotized athlete. "You may triumph in the competition." These recommendations may confer psychological and physical advantages for athletes (Ji, 1992).

Hypnosis Can Reduce the Fears of Athletes

Fears impede athletes' training and competitions in shooting. An individual athlete's concerns may exert a collective impact, complicating the continuation of group training. Moreover, worry can induce mental disorders in athletes, impair concentration, create muscle tension, elevate heart rate and breathing, induce limb weakness, and perhaps lead to collapse (Xu and Cao, 2013). These anomalies can lead to distorted motions in athletes, induce boredom among sports participants, and, in extreme cases, result in accidents and injury. Reid's research indicates that hypnosis can assist individuals in managing panic disorder by alleviating fear, stress, and anxiety (Reid, 2017). Hypnosis induces relaxation in athletes, while hypnotists provide encouragement with calming statements. "You are safeguarded despite your anguish," for instance, or "you can regulate your cognition." The hypnotist will provide ways for athletes to manage their anxieties, such as "when you are apprehensive about training, practice deep breathing to achieve a state of calm." Hypnosis provides athletes with an exceptional opportunity to cultivate relaxation while addressing their anxieties and competing.

Hypnosis Can Help Athletes Learn and Improve Their Technique

The enhancement of individual athlete skills and strategies is achieved not alone via the augmentation of muscle strength and physical capabilities, but also through the development of athletes' mental fortitude. Consequently, all physical activities entail a relationship between

the brain and the body. Athletes gain advantages from visualizing skills training as it enables them to enhance their strengths, eliminate weaknesses, refine their athletic abilities, and maintain confidence, focus, and motivation (Ji, 1992).

Athletes are often encouraged to visualize the significant event during their training and to closely identify with the performance. They could monitor all elements affecting them, including their thoughts, physical feelings, competitors, and other significant considerations. This strategy can help athletes recognize previously unnoticed elements of their performance experience, perhaps revealing essential information. Moreover, hypnosis has demonstrated enhancement in the quality of visualization skills related to self-efficacy, skill acquisition, and athletic performance (Taylor et al., 1993).

Hypnosis Can Assist Athletes in Rapidly Alleviating Fatigue and Replenishing Energy

Athletes engage in rigorous and sustained training, leading to musculoskeletal soreness and physical fatigue. Athletes often demand adequate sleep, massage, hydrotherapy, and nutritious meals to restore their physical strength and energy. During competition, fatigue and physical exertion can significantly influence the outcome of success or failure. An athlete possessing greater energy than his adversary may have an enhanced likelihood of victory. Consequently, it is imperative to promptly restore energy and recuperate physical strength during the competition.

Niu, 2013 Hypnosis can promptly alleviate fatigue and rejuvenate physical strength. It may be executed prior to or subsequent to training, or during the competition. When an athlete enters a trance, their muscles can achieve total relaxation. "You have entered a state of hypnosis; your muscles are completely relaxed, and the fatigue will be alleviated instantaneously by the massage." "Fatigue has been mitigated, and your energy and strength have now been rejuvenated," for instance, may be proposed during the process. "After three or more hours of rest, your fatigue has dissipated, and you feel revitalized and strong. Continue playing; your energy and physical prowess will be sufficient." These positive suggestions may aid athletes in rapidly rejuvenating their energy and enhancing their confidence.

Hypnosis can be helpful in enhancing performance

A burgeoning corpus of evidence indicates that hypnosis can aid athletes in enhancing their mental fortitude, boosting self-confidence, alleviating fatigue, replenishing energy,

improving focus during training and competition, and refining their talents. Currently, there is a deficiency of substantial experimental evidence to validate its mechanism, and there exists a scarcity of methodologically rigorous empirical studies supporting its value. Consequently, the application of hypnosis in athletics necessitates further extensive and comprehensive investigation, along with empirical validation. Nonetheless, it is undeniable that hypnosis is a straightforward and accessible method for altering physical and mental conditioning without any specific conditions for physical or mental state.

Optimal Brain Wave States for Hypnosis

Although a light trance (Alpha brain waves) is beneficial, most hypnotherapists prefer to engage clients in a medium level trance (Theta brain waves). The customer will be cognizant of, yet undistracted by external sounds. They will experience a greater depth of relaxation and increased suggestibility compared to a light trance. Approximately 80% of the population can be induced into this moderate level of hypnotic trance. Nonetheless, while it can be contended that fewer than 50% of the patients attain this state, optimal hypnotherapeutic outcomes are achieved when the client is in a profound trance (a somnambulistic trance characterized by Delta brain waves).

In this profound condition, the client can open their eyes without disrupting hypnosis, while selective and illusory sensory perception and the acceptance of intricate suggestions transpire during a deep hypnotic trance. Any degree of trance, including a mild trance, can be useful if it permits the client's cognitive processes to be engaged without the incessant scrutiny of the conscious mind.

STATEMENT OF PROBLEM

The statement of the present study is *"Effect of Hypnotherapy on various Neurological,Psycho-physiological parameters and performance among Elite Indian Shooters"*.

OBJECTIVES OF THE STUDY

The primary objective of the study is to investigate whether Hypnotherapy influences neurological & psycho-physiological aspects such Brain waves, Competition anxiety, Flow State, Mental Toughness, blood pressure respiration rate, skin conductance and heart rate of

elite Indian shooters in competition and also to study the relationship among Neurological and psycho-physiological variables.

The following objectives made for the present study:

1. To study the difference in patterns of Brain waves among Rifle ,Pistol and Shotgun shooters pre and post administration of 12 weeks of hypnotherapy.
2. To study the difference in level of competition anxiety, Flow state ,Mental skills among Rifle ,Pistol and Shotgun shooters pre and post administration 12 weeks of hypnotherapy.
3. To study the difference in blood pressure, heart rate ,respiration rate and skin conductance among Rifle ,Pistol and Shotgun shooters pre and post administration of 12 weeks of hypnotherapy.
4. To study the difference in performance among Rifle ,Pistol and Shotgun shooters pre and post administration of 12 weeks of hypnotherapy.
5. To study the relation among neurological and psycho-physiological variables pre and post administration of 12 weeks of hypnotherapy.

RESEARCH QUESTION

1. *What effect does the hypnotherapy have on the levels of neurological & psycho-physiological aspects such Brain waves, Competition anxiety, Flow State, Mental skills, blood pressure respiration rate, skin conductance and heart rate of elite Indian shooters in competition*
2. *What will be the relationship among Neurological and psycho-physiological variables.*

DELIMITATIONS

1. The study will be delimited to sports persons participating in house shooting competitions.
2. The study will be delimited to sports persons having been participating in competitive shooting sports for minimum of 3 years.
3. The study will be delimited to hypnotherapy as an intervention of 12 sessions per shooter
4. The study will be delimited to 60 sports persons participating competitions.

5. The study will be delimited to sports persons aged between 18 to 25 years.
6. The study will be delimited to some Neurological variables like
    - Brain waves
7. The study will be delimited to some psychological variable like
    - Mental Skills
    - Competition anxiety
    - Flow State
8. The study will be delimited to some psycho-physiological variables like
    - Heart rate
    - Respiration rate
    - Blood pressure
    - Skin conductance

HYPOTHESES

1. It is hypothesized there will be a significant difference in patterns of Brain waves among Rifle ,Pistol and Shotgun shooters pre and post administration of 12 weeks of hypnotherapy.
2. It is hypothesized there will be a significant difference in level of Competition anxiety, Flow State, Mental skills among Rifle ,Pistol and Shotgun shooters pre and post administration of 12 weeks of hypnotherapy.
3. It is hypothesized there will be a significant difference in blood pressure ,heart rate respiration rate and skin conductance among Rifle ,Pistol and Shotgun shooters pre and post administration of 12 weeks of hypnotherapy.
4. It is hypothesized there will be a significant difference in performance among Rifle ,Pistol and Shotgun shooters pre and post administration of 12 weeks of hypnotherapy.
5. It is hypothesized there will be a positive relation between neurological and psycho-physiological variables.

NEED AND SIGNIFICANCE OF THE STUDY

Sports achievement is always a multi-fold phenomenon in the sense that it depends on many factors, such as techno-tactical actions, motor fitness, physiological conditioning and more importantly psychological factors.

The present study intends to investigate some of the neurological and psycho-physiological factors and shooting performance. The present study will mainly focused on Brain waves, competition anxiety ,Flow state, Mental Toughness, blood pressure, respiration rate, skin conductance and heart rate among shooters, where the variables are going to be investigated before and after administration of 12 weeks hypnotherapy training.

The importance of this study may be summarized in the following manner.

1. The review of studies has revealed that there are hardly few studies which have concentrated neurological & psycho-physiological aspects such Brain waves, competition anxiety , Flow state ,Mental skills, blood pressure breathing rate, skin conductance and heart rate of shooters. Even available studies have concentrated on fragmented aspects of psychophysiological variables. In the present study an attempt will be made to provide an integrated picture of Neurological, psycho-physiological and performance.
2. The findings and knowledge of the present study will help the coaches, sports trainers, sports administrators &the physical educationist in their professional work.
3. The present study will acquaint the coaches with the knowledge of neurological & psycho-physiological aspects such Brain waves, competition anxiety, Flow state, Mental Toughness, blood pressure, respiration rate, skin conductance and heart rate of shooters. of shooters, which are more useful in the modern, sports not only in during the training period, but also during different levels of sports competitions.
4. Knowledge of- neurological & psycho-physiological of shooters will help sports scientists in predicting success of shooters or to expect the peak performance.
5. The findings of the study will provide a guideline to future research investigators in sports psychology as well as Neurological & psycho- physiology to conduct further research in the field of sports.
6. The findings of the study will enhance further knowledge to existing of sports neurology, psychology and physiology.

Chapter- II

REVIEW OF RELATED LITERATURE

Aurore et al (2021) explored psychophysiological changes during hypnosis, in addition to its central brain effects, can assist to better understand the nature and scope of the hypnotic phenomena. Although hypnosis is assumed to promote a relaxation response, investigations using objective psychophysiological measures in conjunction with hypnosis techniques have produced mixed findings. We evaluate the literature to better understand the effects of hypnosis on ANS activity and, more specifically, the stress/relaxation response, such as heart rate variability and electrodermal activity. A series of Pubmed searches found up studies that reported psychophysical measures taken during hypnosis. The information was gathered with an eye toward hypnotizability and the effects of certain suggestions or tasks on the findings. They discovered 49 research with 1315 participants, 45 of which used healthy volunteers and only four of which involved patients. Thirty patients were tested for heart rate, 18 for heart rate variability, 25 for electrodermal activity, and 23 for respiratory signals, as well as other physiological characteristics. Under hypnosis, studies demonstrate a reduction in sympathetic reactions and/or an increase in parasympathetic tone. Older studies (N = 16) that used manual analysis, small sample sizes (30, N = 31), and uncontrolled multiple comparisons are also highlighted as methodological weaknesses. Nonetheless, findings confirm that hypnosis causes a physiological relaxation response and point to future study avenues. There are recommendations for future research in this topic.

Novan, N. A. (2021) intended to examine the impact of progressive muscle relaxation (PMR) exercises on enhancing concentration and performance scores in 10-meter shooting. The instruments employed included the Concentration Grid Test to assess concentration and the evaluation of 60 rounds from both men and women in a 10-meter shooting performance test. MANCOVA was employed to analyze data, utilizing shot scores and concentration as dependent variables and covariates to assess performance. The MANCOVA results demonstrated a substantial main effect for exercise methods, indicating that variations in exercise methods significantly influenced concentration and shooting scores. When athletes encounter the exigencies of optimal performance.

Sabrina Mattle, et al (2020) This study investigated the impact of a single hypnosis session on shooting performance in a 10-meter air rifle competition. The analysis involved eight shooting athletes from the Swiss national team and employed an A-B-A single case study design with two baseline measurements. The results indicate that the hypnosis intervention exerted a marginally beneficial influence on the performance of three athletes relative to all other assessments, six persons exhibited minor enhancements compared to a single baseline measurement, and two subjects experienced a decline in performance. The participants' subjective evaluations of the intervention's efficacy and their satisfaction demonstrated feasibility, with all subjects perceiving the hypnosis intervention as advantageous. Moreover, they expressed that upon initiating the competition, they experienced a sense of tranquility, heightened concentration, and increased self-confidence. Consequently, integrating hypnosis into a shooting athlete's training program shows potential; however, additional research is required.

Truzoli, R. (2020, This study aimed to validate the effectiveness of a group therapy incorporating hypnosis-related techniques for mixed-group outpatients experiencing anxiety or depression. In the whole sample, there were 6 males and 25 females. The sad grouping comprised one male and twelve female participants; the anxious subgroup consisted of five men and fourteen females.The clinical impact appeared to be substantial, as indicated by the figures for d. The treatment demonstrated cost-effectiveness for very prevalent outpatient diseases. The results of this study support the effectiveness of hypnotic group treatment.

Oberoi J, et al (2018) This study involved 20 patients (8 males, 12 females) who, under hypnosis, had reduced resistance to local anaesthesia application and exhibited considerably lower pulse rates. The researchers determined that hypnosis may be an effective method for addressing behavioral issues, as it results in reduced resistance and diminished anxiety in patients.

Chen, et al (2017). This meta-analysis aimed to aggregate the immediate and long-term advantages of hypnosis on anxiety in cancer patients, while also identifying moderators of these effects. A meta-analysis of 20 studies indicated that hypnosis had a substantial immediate impact on anxiety in cancer patients. Pediatric study samples, hematological malignancies, investigations on procedure-related stressors, and mixed-gender samples exhibited bigger mean effect sizes. Self-hypnosis proved to be significantly less effective

than therapist-administered hypnosis.

Preet, C. (2017) Investigated the impact of a six-week psychological skills training (PST) program on mental toughness and sports anxiety. The results of sixteen youth national level target shooters indicated a significant enhancement in mental toughness, together with a decrease in condition anxiety. Significant positive correlations were identified between mental toughness and visualization capacity, self-confidence, anxiety and worry management, attention, and relaxation ability. Keywords: Psychological skills training, mental resilience, state anxiety, target shooting.

Ramírez-Carrasco, A. (2017). The objective of this study was to evaluate the efficacy of hypnosis combined with conventional behavior control techniques during infiltration anesthesia. A controlled randomized clinical trial was performed including 40 healthy children (16 males and 24 females) aged 5 to 9 years. Inclusion in the sample indicates that the combination of hypnosis and typical behavior management techniques reduces heart rate during anesthetic administration, suggesting that hypnotic therapy may assist in alleviating anxiety and pain.

Milling, L. S., & Randazzo, E. S. (2016) The baseline and intervention phases of single case-design studies were evaluated, necessitating multiple assessment points during the baseline phase to create a stable trend for the target behavior. A comprehensive examination of the APA PsycInfo database yielded 17 papers that fulfilled these criteria. Hypnosis has been shown to enhance athletic performance across various sports, with the most substantial evidence seen in basketball, golf, soccer, and badminton. Two hypnotic interventions met the criteria for potentially helpful empirically supported therapies, indicating that hypnosis can be utilized in sports psychology to implement evidence-based practice. Professionals collaborating with athletes should consider the potential of hypnosis to enhance performance.

Ghasemi, A. & Modabberi, B. (2015) Examined the impact of mental skills training on mental toughness in competitive shooters. The study of gain scores and independent t-tests revealed that mental skills training significantly impacted certain sub-scales, including emotional control, commitment, confidence in talents, interpersonal confidence, and challenge. The researchers determined that mental skills training could enhance mental toughness in competitive shooters.

Kekecs, Z., et al (2015) studied the nature and breadth of the hypnotic phenomena, as well as the mechanisms underlying the effects of hypnosis in various medical diseases, requires investigating autonomic nerve system (ANS) changes during hypnosis. Electrodermal activity and pulse rate variability (PRV) were recorded in 121 young individuals to characterise ANS alterations during hypnosis. Both groups underwent test suggestions and were either administered hypnotic induction (hypnosis condition) or exposed to music (control condition). At baseline, subsequent to induction and following de-induction, sequences of silent and experimental auditory stimuli were administered. The PRV high frequency (HF) power and skin conductance level (SCL) were measured at each phase and compared across groups. Hypnosis decreased SCL relative to the control condition, although no differences in HF were seen among the groups. Moreover, in the hypnosis cohort, hypnotic suggestibility did not influence autonomic nervous system changes. The findings indicate that hypnosis diminishes tonic sympathetic nervous system activity, potentially elucidating its efficacy in treating illnesses associated with the sympathetic nervous system, including rheumatoid arthritis, hot flashes, hypertension, and chronic pain. Further study using diverse control conditions is required to examine the specificity of the sympathetic effects of hypnosis.

Jamieson, G. A. (2014) Research indicates that, based on ideas of altered state hypnosis, individuals with high hypnotic susceptibility enter a distinct state of mental processing during hypnotic induction, facilitating the emergence of anomalous experiences in reaction to particular hypnotic suggestions. In that scenario, a distinct pattern of alterations in functional connectivity (shared information) among brain regions post-hypnotic induction should be evident in individuals with high hypnotic susceptibility, but not in those with low susceptibility. Twenty-eight channel EEG was recorded with participants' eyes closed from 12 highly susceptible (highs) and 11 low susceptible (lows) individuals before and after a standard hypnotic induction. The EEG was employed to assess functional connectivity through coherence (COH) and the imaginary component of coherence (iCOH), which is not influenced by volume conduction effects. COH and iCOH were computed for all electrode pairs in the frequency ranges of delta (0.1–3.9 Hz), theta (4–7.9 Hz), alpha (8–12.9 Hz), beta1 (13–19.9 Hz), beta2 (20–29.9 Hz), and gamma (30–45 Hz). The findings indicated that theta iCOH elevated from pre-hypnosis to hypnosis in those with high scores, but not in those with low scores, with a significant majority of relevant connections centered around a central-parietal hub. A decrease in beta1 iCOH was seen from pre-hypnosis to hypnosis, highlighting a fronto-central and occipital hub in those with high susceptibility compared to those with low

susceptibility. No significant differences in COH or spectral band amplitude were seen across any frequency range. The findings indicate that hypnotic induction caused a qualitative alteration in the organization of specific control systems in the brains of highly susceptible participants compared to those with low susceptibility. This alteration in the functional organization of brain networks may indicate the proposed "hypnotic state."

Pates J. (2013) This study examined the impact of hypnosis on the performance and flow-state experiences of an elite senior European Tour golf professional. The experimental effect was assessed throughout 11 Senior European Tour golf events. A single-subject design was associated with a methodology to assess the player's internal experience in order to analyze performance and flow metrics. The player's average stroke score and average flow scores enhanced from baseline to intervention, as indicated by the results. There were no overlapping data points between baseline and intervention conditions for all performance and flow-state scores. Qualitative data suggests that hypnosis can assist individuals in regulating their emotions, thoughts, sensations, and perceptions.

According to Uslu et al. (2012), The hypnotic state can affect cerebral blood circulation. The researchers investigated the impact of hypnosis on heart rate variability (HRV). Hypnosis resulted in a decrease in heart rate variability among women. Post-hypnotic values surpassed pre-hypnotic and hypnotic levels. During the posthypnotic stage, women exhibited the most elevated heart rate variability characteristics. Hypnosis seems to stimulate cardiac and cognitive processes. Certain cardiac clinical diseases characterized by autonomic imbalance or cardiac arrhythmias may get advantages from hypnosis.

Daniel Kramer (2007) This study examined the predictive capacity of lateralized cortico-electrical patterns (assessed via EEG) and arousal (evaluated using Galvanic Skin Conductance) on performance in a visuo-spatial motor-response task. Alpha (8-12Hz) and delta (1-4Hz) activity in the temporal lobes, along with skin conductance, were examined as indicators of enhanced performance. A regression analysis of the data indicated that increased left temporal alpha activity, in contrast to right temporal lobe activity, positively predicted performance. No significant results were observed for delta activity; however, skin conductance exhibited a favorable correlation with performance. Unexpectedly, theta (4-8Hz) and mid beta (16-20Hz) activity were determined to significantly influence performance..

Saadat, H. et al. (2006). Investigated the impact of hypnosis on preoperative anxiety. Participants were randomized into three groups: a hypnosis group (n = 26) that received well-being recommendations; an attention-control group (n = 26) that got attentive listening and support without particular hypnotic suggestions; and a "standard of care" control group (n = 24). No substantial age disparities were observed among the three study groups (42 ± 10 years compared 39 ± 10 years versus 43 ± 10 years), nor were there any gender differences (females/males, 70%/30% versus 82%/18% respectively 80%/20%). The hypnosis group exhibited a notable reduction in anxiety of 56 percent, while the attention-control group saw a 10 percent increase in anxiety, and the control group reported a 47 percent rise in anxiety (P = 0.001). Ultimately, we found that hypnosis significantly alleviates preoperative anxiety. Future research should examine the effect of preoperative hypnosis on postoperative outcomes.

Storm, H et al. (2002). This study aimed to evaluate the correlation between the quantity and magnitude of SC fluctuations and perioperative stress monitoring. Alterations in stress indicators such as blood pressure, heart rate, norepinephrine, and epinephrine levels were compared to SC. Variations in the Bispectral Index were also contrasted with the Sedation Scale (BIS). The quantity (P 0.001) and magnitude (P 0.01) of SC changes exhibited a positive correlation with blood pressure, epinephrine concentrations, and norepinephrine concentrations. Moreover, both the quantity (P 0.001) and amplitude (P 0.001) of SC fluctuations exhibited a positive correlation with the BIS. Moreover, the average number of SC fluctuations among the 11 patients demonstrated a consistent stress response, as assessed by alterations in mean norepinephrine levels after tracheal intubation. Determined that the frequency of SC fluctuations may serve as an effective indicator of perioperative stress.

Laura M. et al (1990) In their investigation, four physiological measures were documented: electromyogram, respiratory rate, heart rate, and skin conductance. The hypothesis posited that (a) physiological response during hypnosis would vary based on the task instructions, and (b) individuals with high hypnotizability would demonstrate more physiological responsiveness than those with low hypnotizability. The first hypothesis received affirmation from all four metrics. The second hypothesis was corroborated solely by heart rate measurements.

Arreed F. Barabasz (1982) The Stanford Hypnotic Clinical Scale: Adult (SHCS) was revised to incorporate a post-hypnotic suggestion for analgesic response, and assessments of

pain threshold and tolerance were conducted before the restricted environmental stimulation technique (REST), immediately following REST, and 10–14 days thereafter. Data on occipital EEG alpha, skin conductance, and peripheral, core, and chamber temperature were acquired before, during, and after REST. SHCS and pain tolerance scores significantly improved for subjects exposed to REST immediately and 10–14 days later, as indicated by the findings of the multivariate analysis of variance.

Keith E. et al (1980) examined Heart rate, electrodermal activity, respiration rate, frontalis muscle tension, and occipital electroencephalographic activity were monitored while six female subjects were hypnotized and six additional female subjects simulated hypnosis. Physiological data was collected over seven days during seven sessions. Throughout their encounters, both groups of subjects exhibited notable decreases in heart rate and electroencephalographic alpha activity relative to pre- and post-hypnotic measurements. Moreover, throughout their experiences, both groups of subjects exhibited substantial increases in electroencephalographic beta activity. Throughout this period, both groups of subjects had diminished levels of electrodermal activity, skin conductance, and respiratory rate.

Herdis L. et al (1973) Investigated the potential reduction of hypertension using (a) muscular relaxation and (b) hypnosis. Six non-medicated hypertension patients served as controls, while an additional six patients received treatment involving muscle relaxation and hypnosis. Both systolic and diastolic pressures were markedly diminished in the no-drug and drug-treated cohorts, whereas no significant reduction was observed in the control group. Muscle relaxation diminished hypertension levels, whereas hypnosis completely eradicated them. Instruction in self-relaxation and self-hypnosis was provided.

Paul, G. L. (1969) Examined the impact of hypnotic suggestion and brief relaxation training on subjective tension and discomfort (anxiety differential), alongside physiological arousal indicators (heart rate, respiration rate, tonic muscle tension, skin conductance). Three cohorts of undergraduate females (N = 20 each) engaged in separate sessions, one week apart, receiving one of the following interventions: (1) abbreviated progressive relaxation training utilized in systematic desensitization therapy; (2) a hypnotic induction focusing on direct suggestions of relaxation, heaviness, warmth, drowsiness, and sleep; or (3) a self-relaxation control procedure, included to assess the effects of resting quietly for an equivalent duration with instructions to Both relaxation training and hypnotic suggestion demonstrated

significantly greater effects than the control group, with relaxation training surpassing hypnotic suggestion.

Chapter III

RESEARCH METHODOLOGY

Design of the Study

The present study will be an experimental pre-post intervention-based research i.e., an empirical interventional study to estimate the impact of Hypnotherapy influences neurological, psycho-physiological and performance aspects such Brain waves, competition anxiety, flow state, mental skills, blood pressure, respiration rate, heart rate & skin conductance respectively of elite Indian shooters in competition and also to study the relationship among Neurological, psycho-physiological and performance variables among the target population (Shooters).

Selection of Subjects/Sample

The inclusion criterion for selection of sample consisted of Indian elite shooters with a mixed set of participants' i.e., both males and females, who were training from 3 to 6 years and their age may range between 15 to 25 years from Dr. Karni Singh Shooting range ,New Delhi. The sample (N=60) will be selected at random and will be assigned to either experimental (N=10) or active control group (N=10) for Rifle, Pistol and shotgun each making the total sample size of N=60.

- Experimental group 1 (Pistol Shooters) = 10
- Experimental group 2 (Rifle shooters) = 10
- Experimental group 3 (Shotgun shooters) = 10
- Active Control group 1 (Pistol Shooters) = 10
- Active Control group 2 (Rifle shooters) = 10
- Active Control group 3 (Shotgun shooters) = 10

Convenient sampling and randomized assignment for control and experimental groups will be considered as the sampling technique for this proposed study.

Selection of Variables

After going through the literature available and understanding various factors associated with the problem, Following variables will be selected to test during the study:

1) **Dependent variables:**

A) Neurological

- Brain Waves

B) Psychological:

- Flow State
- Sports Competition Anxiety
- Mental skills

C) Physiological:

- Heart Rate
- Blood Pressure
- Respiration rate
- Skin conductance

D) Performance:

- Score for their respective shooting event in an in-house competition

2) **Independent Variables:**

- Hypnotherapy

Neurological variables such as brain waves will be studied along with psychological parameters such as competition anxiety ,flow state, mental toughness and physiological response through biofeedback and digital blood pressure machine will be used for factors such as, Heart rate, Respiration rate, skin conductance and blood pressure, considering these as dependent variables under study along with which the data will also be collected for performance of the shooters through scores from their respective shooting events in an in-house competition. The independent variable for the current study will be hypnotherapy and its effects will be studied for the aforementioned dependent variables.

Tools for Collecting the Data

Questionnaires including self-report measures, Neurological, psycho-physiological measurement tools and performance scores will be used for data collection :

Flow Trait Scale (FLOW): The 36-item FLOW instrument is based on Csikszentmihalyi's theory of flow as applied to a sport setting (see Jackson & Csikszentmihalyi, 1999). The instrument, developed by Jackson and colleagues (Jackson & Eklund, in press; Jackson & Marsh, 1996; Marsh & Jackson, 1999), measures nine flow experiences in sport: action-awareness merging, clear goals, unambiguous feedback, concentration on task, sense of control, time transformation, and autotelic (intrinsically rewarding) experience. Research (Jackson & Eklund, in press; Jackson & Marsh, 1996; Marsh & Jackson, 1999) demonstrates that the Flow responses are reliable (reliability coefficients varied between .80 and .92) and have a well-defined factor structure as shown by confirmatory factor analysis.

The flow state experience comprises of nine key dimensions:

1. **Challenge-skills balance-**Flow requires an equal balance between the skill level and the challenge. If the challenge is too demanding, we get frustrated. If it is too easy, we get bored. In a flow experience, we feel engaged by the challenge, but not overwhelmed.
2. **Action-awareness merging-**We are often aware of and thinking about something that has happened, or might happen, in another time or place. But in flow, we are completely absorbed in the task at hand.
3. **Clear Goals-**In many everyday situations, there are contradictory demands and it is sometimes quite unclear what should occupy our attention. However, in a flow experience, we have a clear purpose and good grasp of what to do next.
4. **Unambiguous feedback-**Direct and immediate feedback is continuously present so that we are able to constantly adjust our reactions to meet the current demands. When we are in flow, we know how well we are doing, all the time.
5. **Concentration on the task at hand-**High levels of concentration narrow our attention excluding any unnecessary distractions. Because we are absorbed in the activity, we are only aware of what is relevant to the task at hand, and we do not think about unrelated things.

6. **Sense of control-**An absolute sense of personal control exists, as if we are able to do anything we want to do.
7. **Loss of self-consciousness-**A lack of awareness of bodily needs as self-consciousness disappears. We often spend a lot of mental energy monitoring how we appear to others. In a flow state, we are too involved in the activity to care about protecting our ego.
8. **Transformation of time-**A distorted sense of time occurs. Time either slows down or flies by when we are completely engaged in the moment.
9. **Autotelic experience-**Flow is an intrinsically rewarding activity; the activity becomes autotelic, an end in itself, done for its own sake.

Sports competition anxiety test (SCAT): This test developed by Martens (1977) is a self-reporting questionnaire comprising of 15 questions on anxiety that assesses an athlete's responses to a series of statements about how they feel in a competitive situation and based on their response, the administrator of the test can determine a measure of their level of anxiety as low, moderate and high. reliability coefficient of this test as 0.77.

The Ottawa Mental Skills Assessment Tool (OMSAT): Durand-Bush, N., Salmela, J. H., & Green-Demers, I. (2001). The OMSAT is 85 items valid sport psychology tool to assess the current mental strengths and weaknesses of athletes and other high achievers and design appropriate, training programs for performance improvement.it will be employed, which is an instrument developed to measure a broad range of 12 mental skills (Salmela, 1992) grouped under three broader conceptual components—foundation, psychosomatic, and cognitive skills and the scales had acceptable internal consistency, with the mean alpha score being 80.

It consists of 12 subscales:

1. Goal setting
2. Belief/ confidence
3. commitment
4. stress control
5. relaxation
6. fear control
7. energising
8. focusing

9. imagery
10. competition planning
11. mental practice
12. re-focusing

Biofeedback Device for Neurological and Physiological Variables

Biofeedback is a technique we can use to learn to control some of our body's functions, such as our heart rate.

Biofeedback device can measure:

- **Brain waves.** This type uses scalp sensors to monitor our brain waves using an electroencephalograph (EEG).
- **Respiration Rate.** During respiratory biofeedback, bands are placed around our abdomen and chest to monitor our breathing patterns and respiration rate.
- **Heart rate.** This type uses finger or earlobe sensors with a device used to detect blood volume changes (photoplethysmography). Or sensors placed on our chest, lower torso or wrists use an electrocardiograph (ECG) to measure our heart rate and how our heart rate varies.
- **Skin Conductance.** The skin conductance response, also known as the electrodermal response (and in older terminology as "galvanic skin response"), is the phenomenon that the skin momentarily becomes a better conductor of electricity when either external or internal stimuli occur that are physiologically arousing. Arousal is a broad term referring to overall activation, and is widely considered to be one of the two main dimensions of an emotional response. Measuring arousal is therefore not the same as measuring emotion, but is an important component of it. Arousal has been found to be a strong predictor of attention and memory.

Dr. Morepen Blood Pressure Monitor BP-02: Dr. Morepen bp 02 is a fully automatic, digital blood pressure measuring device for use on the arm, which enables very fast and reliable measurement of the systolic and diastolic blood pressure as well as the pulse frequency by way of the oscilometric method of measuring.

- S**ystolic pressure** is the pressure of the blood in your arteries when your heart contracts or beats.
- **Diastolic pressure** is the pressure of the blood in your arteries between beats, when your heart relaxes.

Interview- Individual interview may be conducted for 24 shooters randomly selected (12 experimental and 12 control group) along with the baseline data collection process and post administration of the 12 week intervention program

Administration of Test and Collection of Data

The current study will focus on implementing Hypnotherapy which will comprise of 12 sessions to each shooter of 30-45 minutes each, spaced over 12 weeks. Orientation of the participants will be conducted, Initially it is proposed that the sample will be randomly assigned into active control group and experimental group conditions, after which an in-house competition will be conducted, prior to which the measure of all dependent variables will be obtained as baseline. Individual interview may be conducted for 24 shooters randomly selected (12 experimental and 12 control group) along with the baseline data collection process. Subsequently, for the next 12 weeks, the experimental group participants will be given the intervention individually, while for that same time period the active control group will be engaged actively, given in the form of an inspiration reading task and motivational videos.

Post-intervention, again an in-house competition will be organized, and again prior to the competition, the data from various tools will be taken for the aforementioned Neurological psycho-physiological variables and performance. Individual interview may be conducted for the same randomly selected 24 shooters initially.

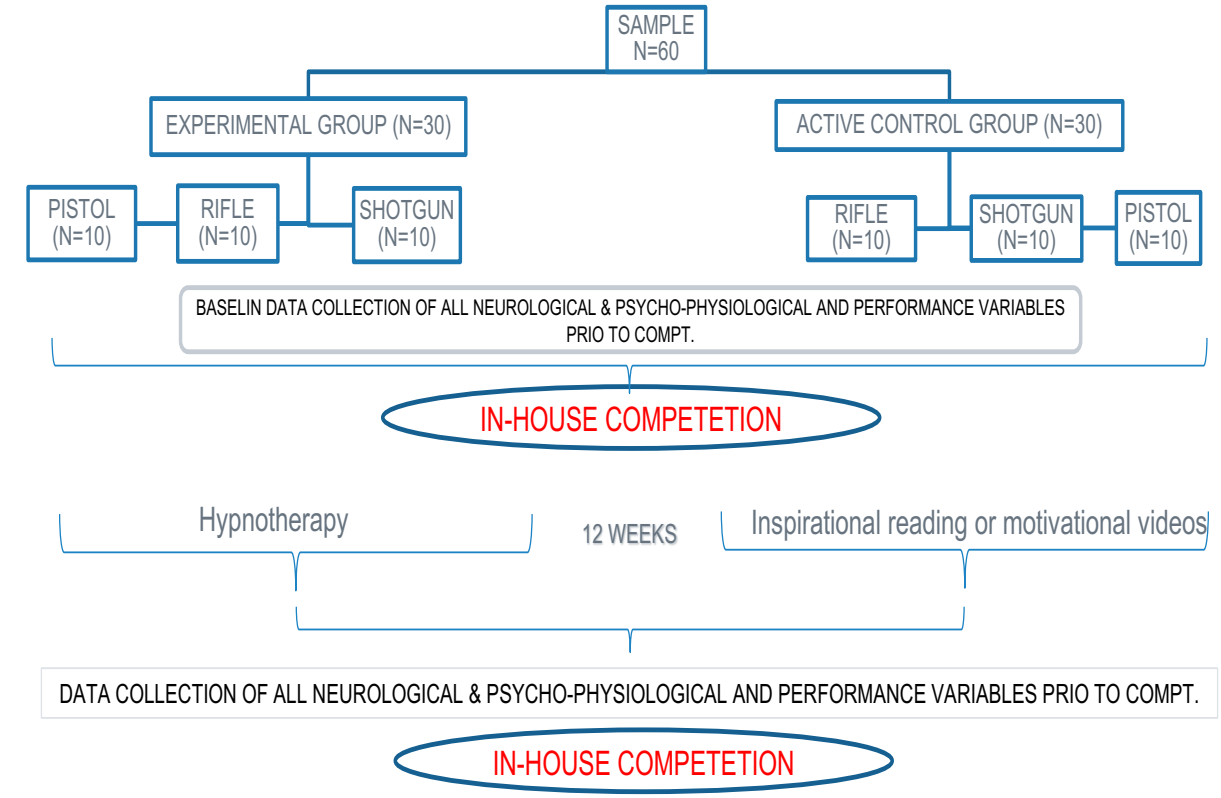

Figure-8 Diagrammatic representation of research design

Statistical Techniques

- ANOVA
- MANOVA
- Cohen's d: Cohen's d may be used to measure the effect size
- Pearson correlation: This may be used to examine the relationship between the variables

APPENDIX-1

Sample Script for Hypnosis

Positive Change

The positive attribute exercise will assist the athlete in connecting with their timeline. It will also facilitate a deeper connection with a positive attribute they possess.Adhere to this procedure: 1

Revisit a previous memory: within your consciousness, return to a moment in your history where you exhibited this commendable characteristic. Engage with this recollection and savor the emotions.

Transcend this old recollection and ascend to the present. Subsequently, provide other examples—previous experiences—in chronological order that illustrate this favorable characteristic.

After immersing yourself in these memories, return to the present before venturing into the future. Envision the experience of exhibiting this commendable characteristic in the future.

Select a favorable attribute: this may include courage, confidence, resilience, success, etc.

Commence by inducing a trance using your preferred technique, then employ the subsequent script to integrate the early learning set with deep trance identification.

Early Learning Set & DTI script:

The positive attribute exercise will aid the athlete in engaging with their timetable. It will also foster a more profound connection with a positive trait they possess.Follow this protocol: 1

Reflect on a past memory: within your mind, return to a point in your history where you demonstrated this admirable trait. Reflect upon this memory and relish the sentiments.

Surpass this antiquated memory and elevate to the present. Subsequently, present other examples—prior experiences—in chronological sequence that demonstrate this advantageous trait.

After reflecting on these experiences, return to the present before progressing into the future. Imagine the sensation of demonstrating this admirable trait in the future.

Choose a desirable trait: this may encompass courage, confidence, resilience, success, etc.

Begin by inducing a trance using your chosen method, then utilize the following script to merge the early learning set with deep trance identification.

APPENDIX-2

Sample Questions

Interview after baseline data collection

1. *Have you ever experienced psychological interventions before?*
2. *Have you ever experienced imagery how do you know about imagery?*
3. *how was your experience with imagery or biofeedback?*
4. *How do you manage your heart rate and respiration rate before and during competition?*
5. *How do you feel before and during a competition?*
6. *What are the various mental skills that you feel are important to your sport?*
7. *Do you know about hypnotherapy?*

Interview after administration of intervention program

1. *How was your experience with the intervention ?*
2. *did it affect your heart rate respiration rate ?*
3. *did it make you feel calmer and more composed? if yes then how ?*
4. *How do you feel when you are in a competition and during competition?*
5. *Is there any difference in your concentration and attention ability ?*
6. *how do you feel while performing?*

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